



6500 Series

6510/6520/6530/6540/6560/6580

# High Power Programmable AC Power Source

User Manual

E2.00



## WARRANTY

EEC certifies that the instrument listed in this manual meets or exceeds published manufacturing specifications. This instrument was calibrated using standards that are traceable to the National Institute of Standards Taiwan.

Your new instrument is warranted to be free from defects in workmanship and material for a period of (2) year from date of shipment. During the warranty period, you must return the instrument to EEC or its branches or its authorized distributor for repair. EEC reserves the right to use its discretion on replacing the faulty parts or replacing the assembly or the whole unit.

Follow below states, EEC will void your warranty.

- Operate under non-normal, contrived omission, or accidental calamity (including, temblor, floods, rebellion, and fire etc.)
- Any non-authorized modifications, tampering or physical damage.
- Elimination of any connections in the earth grounding system or bypassing any safety systems.
- Use of non-authorized parts in the repair of this instrument. Parts used must be parts that are recommended by EEC as an acceptable specified part.

**This warranty does not cover accessories not of EEC manufacture.**

Except as provided herein, EEC makes no warranties to the purchaser of this instrument and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

EEC recommends that your instrument be calibrated on a twelve month cycle.



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# CHAPTER 1: INTRODUCTION

## 1.1 Safety Precaution

- This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.
- Before applying power verify that the instrument is set to the correct line voltage and the correct fuse is installed.
- When using an oscilloscope to measure DUT waveform, please refer description below to avoid DUT, instrument and oscilloscope damages. When the output of AC source has N-G or L-G shorted, customer must use differential isolation type of oscilloscope probe or using isolated oscilloscope.
- In order to avoid the interference, please DON'T combine the cables of input and output from instruments in bundle with GPIB or RS232 cable.

**To prevent accidental injury or death, these safety procedures must be strictly observed when handling and using the test instrument.**

## 1.2 Installing Preparation

This section introduces the standard procedures of EEC's products in unpacking, inspection, preparation before operation and storage environment, and etc.

### Unpacking And Inspection

The instrument was shipped in a wooden crate. If the shipping crate is damaged, inspect the contents for visible damage such as dents, scratches or broken meters. If the instrument is damaged, notify the carrier and the EEC Customer Support department immediately. Please keep the shipping carton and packing material for the carrier's inspection. Our Customer Support department will provide assistance for the repair or replacement of the broken instrument.

### Power Requirement And Line Voltage Selection

Please refer to the Chapter 2.1- Specifications for the line voltage selection required on 6500 Series AC Power Source.

#### **CAUTION**

**Do not switch the line voltage selector switch located on the rear panel while the instrument is on or operating. This may cause internal damage and represents a safety risk to the operator.**

### Operating Environment

Temperatures: 0° - 40° C (32°-104°F)

Relative humidity: 20% - 80%

Altitude: 2,000 meters (6,500 inches)

### **1.3 Storage And Packing**

#### **Operating Environment**

Temperatures: 0° - 40° C (32°-104°F)

Relative humidity: 20% - 80%

Altitude: 2,000 meters (6,500 inches)

#### **Storage Environment**

This instrument may be stored or shipped in environments with the following limits:

Temperature..... -40° to +55°C

Attitude ..... 7,620 meters (25,000 inches)

The instrument should also be protected against temperature extremes, which may cause condensation within the instrument.

#### **Packing**

##### **Original Packing**

Please keep all original shipping carton and packing materials and if it is needed to send for repair, then it can be used for repacking purpose. Kindly contact the EEC Customer Support department for service assistance. Upon delivering goods for repair, please attach along the power cord cable and other accessories along with the instrument and state clearly the actual problem encountered. Nevertheless, it is necessary to stick on the FRAGILE stickers on the packing carton.

##### **Other Packing**

- For using other packing cartons other than the original shipping carton, please follow the
  - packing requirement accordingly if possible:
  - Pack the instrument with polystyrenes or air-compressed plastics.
  - The spaces between the instrument and carton must be occupied with anti-shock sponges and the thickness should at least 70mm-100mm (3-4 inches).
1. Seal neatly on top of the carton filled with instrument.
  2. **Stick on FRAGILE stickers for delivery.**

### **1.4 Field Installation Options**

There are no field installation options on EEC's 6500 Series AC Power Source.



## CHAPTER 2: SPECIFICATION

### 2.1 SPECIFICATION

Model		6510	6520	6530	6540	6560	6580
OUTPUT							
Phase		1 Ø					
Power Rating		10 kVA	20 kVA	30 kVA	40 kVA	60 kVA	80KVA
Voltage	Range	0 - 150 V / 0 - 300 V or 0 - 175 V / 0 - 350 V Selectable (Option 0 - 350 V) or 0 - 300 V / 0 - 600 V Selectable (Option 0 - 600 V)					
	Resolution	0.1 V					
	Accuracy <sup>1</sup>	± (1% of setting + 2 counts)					
Max. Current (r.m.s) <sup>2</sup>	0 - 150 V	84.0 A	168.0 A	252.0 A	336.0 A	504.0 A	672.0A
	0 - 300 V	42.0 A	84.0 A	126.0 A	168.0 A	252.0 A	336.0A
Max. Current (r.m.s) <sup>3</sup> for option 0 - 350 V	0 - 175 V	72.0A	144.0A	216.0A	288.0A	432.0A	576.0A
	0 - 350 V	36.0A	72.0A	108.0A	144.0A	216.0A	288.0A
Max. Current (r.m.s) <sup>4</sup> for option 0 - 600 V	0 - 300 V	42.0 A	84.0 A	126.0 A	168.0 A	252.0 A	336.0A
	0 - 600 V	21.0 A	42.0 A	63.0 A	84.0 A	126.0 A	168.0A
Frequency <sup>5</sup>	Range	45.0 - 70.0 Hz / 45 - 500 Hz (Option) / 360 - 440, 760 - 840 Hz (Option 400 / 800 Hz) Full Range Adjust					
	Resolution	0.1 Hz / 1 Hz					
	Accuracy	± 0.02% of setting					
Total Harmonic Distortion (THD) <sup>6</sup>		< 1% for 110 / 220V, 50 / 60Hz for 300V and Option 350V at Resistive Load < 1.2% for 220 / 440V, 50 / 60Hz for Option 600V at Resistive Load					
Inrush Current		3 times rated Current(r.m.s)					
Crest Factor		3 times rated Current(r.m.s)					
Line Regulation		± 0.1 V					
Load Regulation		± (0.5% of output + 0.5 V) at Resistive Load					
Ramp up / Ramp down	Range	0.1 - 999.9s					
	Resolution	0.1s					
	Accuracy	± (0.1% of setting + 0.2s)					
INPUT							
Phase		3Ø4W					
Voltage		220 (L - N) / 380 Vac (L - L) ±10%					
Max. Current <sup>7</sup>		25 A	50 A	75 A	100 A	150 A	200A

Frequency		47 - 63 Hz		
Power Factor		0.8		
MEASUREMENT				
Voltage	Range	0.0 - 300.0 V / 0.0 - 600.0 V		
	Resolution	0.1 V / 0.2 V		
	Accuracy	± (1% of reading + 2 counts) at Voltage > 5 V		
Current	Range	L	0.00 - 35.00 A	0.0 - 350.0 A
		H	30.0 - 350.0 A	300 - 672 A
	Resolution <sup>8</sup>	L	0.01 A	0.1 A
		H	0.1 A	1 A
	Accuracy	L	± (1% of reading + 5 counts) <sup>9</sup>	
		H	± (1% of reading + 1 count) <sup>9</sup>	
Current (Option 0 - 600 V)	Range	L	0.00 - 35.00 A	0.0 - 350.0 A
		H	30.0 - 350.0 A	300 - 672 A
	Resolution <sup>8</sup>	L	0.01 A	0.1 A
		H	0.1 A	1 A
	Accuracy	L	± (1% of reading + 5 counts) <sup>9</sup>	
		H	± (1% of reading + 1 count) <sup>9</sup>	
Frequency	Range	45.0 - 850.0 Hz		
	Resolution	0.1 Hz		
	Accuracy	±0.1 Hz		
Power	Range	L	0.000 - 3.500 kW	0.00 - 35.00 kW
		H	3.00 - 40.00 kW	30.0 - 80.0 kW
	Resolution	L	0.001kW	0.01KW
		H	0.01kW	0.1KW
	Accuracy	L	± (1.5% of reading + 5counts) at Voltage > 5 V	
		H	± (1.5% of reading + 1count) at Voltage > 5 V	
GENERAL				
Remote Input Signal Interface		ON / OFF, P1, P2, P3		
Memory		8 Memories, 5steps per memory for Voltage, Frequency, Test Time, Delay time and Current, Power Hi, Lo Limit setting		
Sync Output Signal		Yes		
Display		4 group pf digital LED displays		
Protection		OCP, OVP, OPP, OTP, LVP, Short Circuit ; Alarm and shutdown		
Interface <sup>10</sup>		Standard USB & RS232, Option GPIB & Analog card		
Operation Environment		0 - 40 °C / 20 - 80% RH		

Dimension (W x H x D), mm <sup>11</sup>	430 x 472 (579) x 650 (730)	430 x 732 (839) x 650 (730)	600 x 972 (1079) x 900 (980)	600 x 972 (1079) x 900 (980)	800 x 1557 (1662) x 900 (980)	800 x 1557 (1662) x 900 (980)
Dimension (PFC)(W x H x D), mm <sup>11</sup>	430 x 602(709) x 650 (730)	430 x 732 (839) x 650 (730)	600 x 972 (1079) x 900 (980)	600 x 972 (1079) x 900 (980)	800 x 1557 (1662) x 900 (980)	800 x 1557 (1662) x 900 (980)
Weight	128 kg	198 kg	397 kg	450 kg	600 kg	800 Kg
Weight (PFC)	228 kg	350 kg	592 kg	663 kg	885 kg	1000 Kg

\* Product specifications are subject to change without notice.

- When output voltage < 30 V, ADJ = ON can be meet this spec.
- Maximum current when output voltage at 120 / 240 V
- Maximum current when output voltage at 140 / 280 V
- Maximum current when output voltage at 240 / 480 V
- Only one option can be selected among optional output frequency 45 - 500Hz and 400 / 800Hz
- < 1.2% for < 47Hz at output voltage within the 110 - 140 V at Low Range or the 220 - 280 V at High Range (incl. 45 - 500Hz)  
< 1% for ≥ 47Hz at output voltage within the 110 - 140 V at Low Range or the 220 - 280 V at High Range (incl. 45 - 500Hz)  
< 1.2% for output voltage within the 220 - 280 V at Low Range or the 440 - 560 V at High Range (option 0 - 600V)  
< 1.5% for < 47Hz at output voltage within the 220 - 280 V at Low Range or the 440 - 560 V at High Range (option 0 - 600V & 45 - 500Hz)  
< 1.2% for ≥ 47Hz at output voltage within the 220 - 280 V at Low Range or the 440 - 560 V at High Range (option 0 - 600V & 45 - 500Hz)
- Max. Current without PFC Function
- a. When output frequency ≥ 100 Hz & ≤ 500 Hz & N-G short, the current meter guarantee minimum current from 0.01 A  
b. When output frequency ≥ 500 Hz & N-G short, the current meter guarantee minimum current from 0.02 A  
c. When output frequency ≥ 100 Hz & ≤ 500 Hz & N-G short, the current meter guarantee minimum current from 0.02 A at 600 V models.  
d. When output frequency ≥ 500 Hz & N-G short, the current meter guarantee minimum current from 0.03 A at 600 V models
- At Voltage > 5 V for 0 - 300 V; At Voltage > 10 V for 0 - 600 V (option)
- Only one interface can be selected among RS232 & USB, GPIB, Analog card
- Figure in parentheses are maximum values with fixture stand

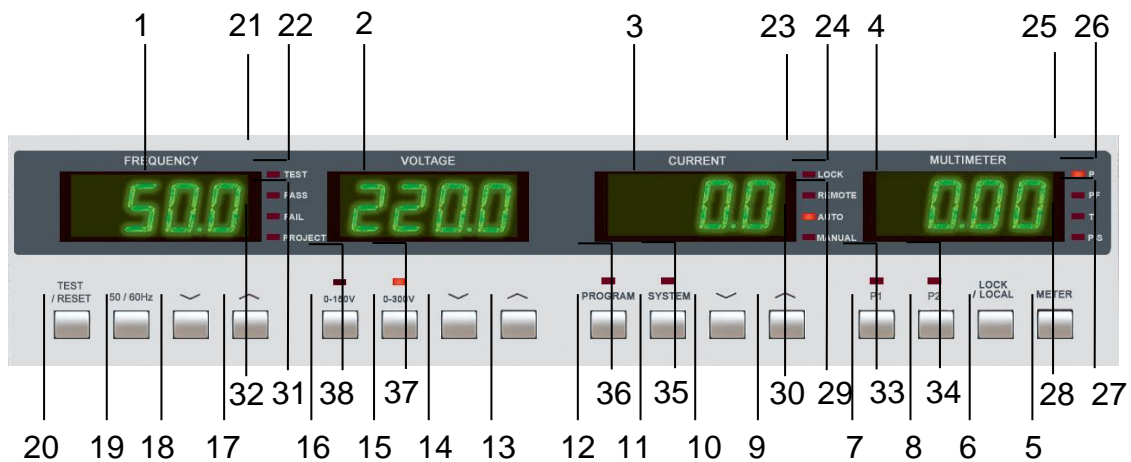
### 【Ordering Information】

- 6510 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (10 kVA)
- 6510P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (10 kVA) with PFC
- 6520 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (20 kVA)
- 6520P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (20 kVA) with PFC
- 6530 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (30 kVA)
- 6530P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (30 kVA) with PFC
- 6540 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (40 kVA)
- 6540P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (40 kVA) with PFC
- 6560 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (60 kVA)
- 6560P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (60 kVA) with PFC
- 6580 High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (80 kVA)
- 6580P High Power Programmable AC Power Source 0 - 300 V / 45 - 70Hz (80 kVA) with PFC
- Opt.608 600 V AC Output for models 6510 & 6520 & with PFC models
- Opt.609 600 V AC Output for models 6530, 6540, 6560, 6580 & with PFC models
- Opt.616 Output Frequency 45 - 500 Hz Full Range Adjust for models 6510 & with PFC models
- Opt.650 Remote Sensing
- OPT.668 suppression Input Voltage
- OPT.671 RCP function for models 6510, 6520, 6530 & with PFC models

- OPT.672 RCP function for models 6540, 6560, 6580 & with PFC models
- OPT.673 Earthquake proof
- OPT.674 Output voltage 350V
- OPT.675 Output frequency 400 / 800Hz only for without PFC models

## CHAPTER 3: PANELS

### 3.1 Front Panel Description



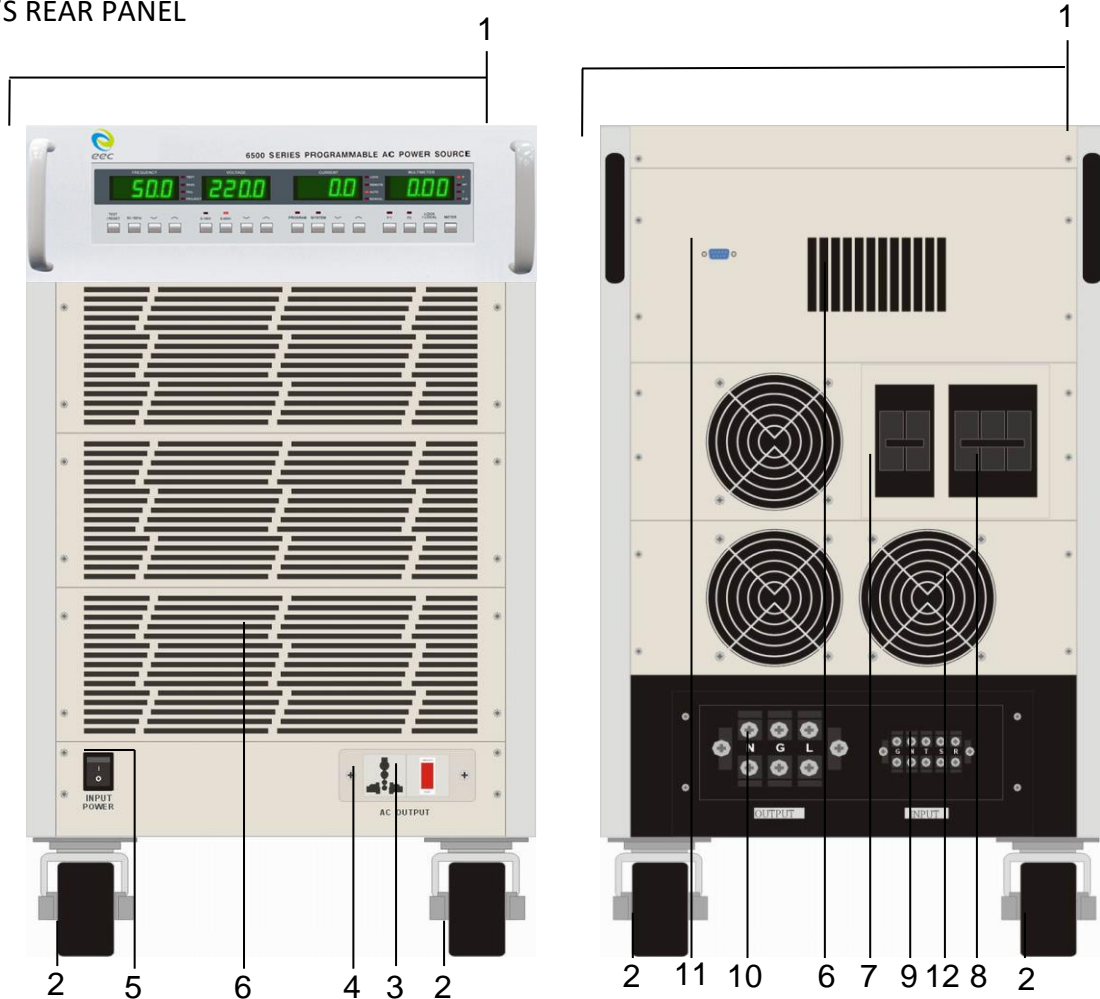
1. **Frequency Display.** When the output is OFF, it shows the frequency setting. Otherwise, it shows the frequency of the output.
2. **Voltage Display.** When the output is OFF it shows the output voltage setting. Otherwise it shows the voltage of the output.
3. **Current Display.** . When the output is OFF it shows the output current setting. Otherwise it shows the current of the output.
4. **Multimeter Display.** Display the value of output wattage 、 power factor test time or the state of Program-Step.
5. **Meter Key.** Select the display of output wattage (P)、 power factor (PF) 、 test time or Program-Step.
6. **LOCK/LOCAL Key.** To disable all the keys on the front panel (ON/OFF) and to escape from programmable operation mode.
7. **P1 Button.** Store setting memory [Press and hold for a second or above]
8. **P2 Button.** Store setting memory [Press and hold for a second or above]
9. **⌵ Key.** To increase high limit of current, as well as SYSTEM and PROGRAM parameters.

10. **✓ Key.** To decrease high limit of current, as well as SYSTEM and PROGRAM parameters.
11. **SYSTEM Key.** Enter or exit from the setting of SYSTEM parameter.
12. **PROGRAM Key.** Enter or exit from the setting of PROGRAM parameter.
13. **⤴ Key.** To increase the output voltage higher than the display value.
14. **✓ Key.** To decrease the output voltage lower than the display value.
15. **High Range Key.** High Range: Voltage Range, 0-300V. (If output voltage is 0-600V, the voltage range is 0 - 600 V.)
16. **Low Range:** Voltage Range, 0-150V. (If output voltage is 0-600V, the voltage range is 0 - 300 V.)
17. **⤴ Key.** To increase the output frequency higher than the display value.
18. **✓ Key.** To decrease the output frequency lower than the display value.
19. **50/60 Hz Key.** If the rating output frequency is 45~70Hz or optional 45~500Hz, press it will be set the output frequency to 50/60 Hz. If the rating output frequency is optional 400Hz, it will be disabled.
20. **TEST/RESET Key.** To turn on/off the output, or start/abnormal operation occurs.
21. **TEST Indicator.** When this LED is ON, the output voltage is turned ON.
22. **PASS Indicator.** When this LED is ON, an automatic output operation has passed.
23. **LOCK Indicator.** When this LED is ON, all the keys are disabled.
24. **REMOTE Indicator.** When this LED is ON, the AC Power Source is controlled by GPIB (RS232) or PLC control.
25. **P Indicator.** When this LED is ON, the MULTIMETER display shows the power value.
26. **PF Indicator.** When this LED is ON, the MULTIMETER display shows the power factor value.

- 27. T Indicator.** When this LED is ON, the MULTIMETER display shows the time duration.
- 28. P-S Indicator.** When this LED is ON, the MULTIMETER display shows the current memory of Program-Step.
- 29. AUTO Indicator.** Indicates the output is at Auto ranging mode.
- 30. MANUAL Indicator.** Indicates the output is at Manual ranging mode.
- 31. FAIL Indicator.** When the LED is ON, it is at abnormal operation.
- 32. PROTECT Indicator.** When the LED is ON, there is a protection at abnormal operation.
- 33. P1 Indicator.** When the LED is ON, the output is set according to P1.
- 34. P2 Indicator.** When the LED is ON, the output is set according to P2.  
When the LED is ON with P1 and P2, the output is set according to P3.
- 35. SYSTEM Indicator.** Indicates the current setting mode is at SYSTEM parameter setting.
- 36. PROGRAM Indicator.** Indicates the current setting mode is at PROGRAM parameter setting.
- 37. Voltage High Range Indicator.** When the LED is ON, the output is set to high range.
- 38. Voltage Low Range Indicator.** When the LED is ON, the output is set to low range.

## 3.2 Panel Description

### A. 14U'S REAR PANEL

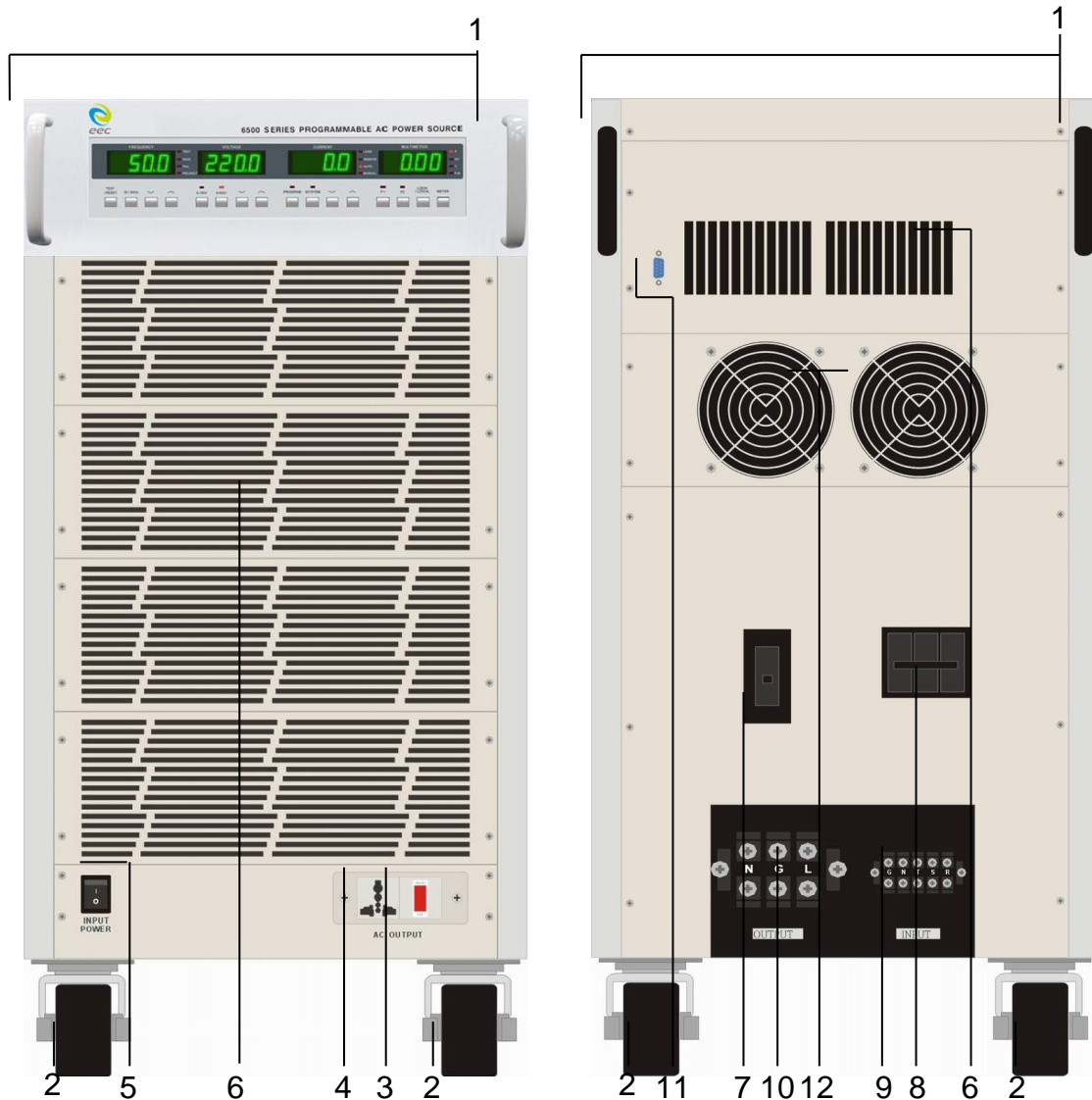


1. Handle
2. Caster Wheels
3. Front Panel Output Switch
4. Universal AC Output Socket (15A)
5. Input Power Switch
6. Ventilation Inlet

7. Output Circuit Breaker
8. Input Circuit Breaker
9. Input Supply Terminal
10. Output Terminal
11. PLC Remote D-Type Connector
12. High-Speed Ventilation Fans



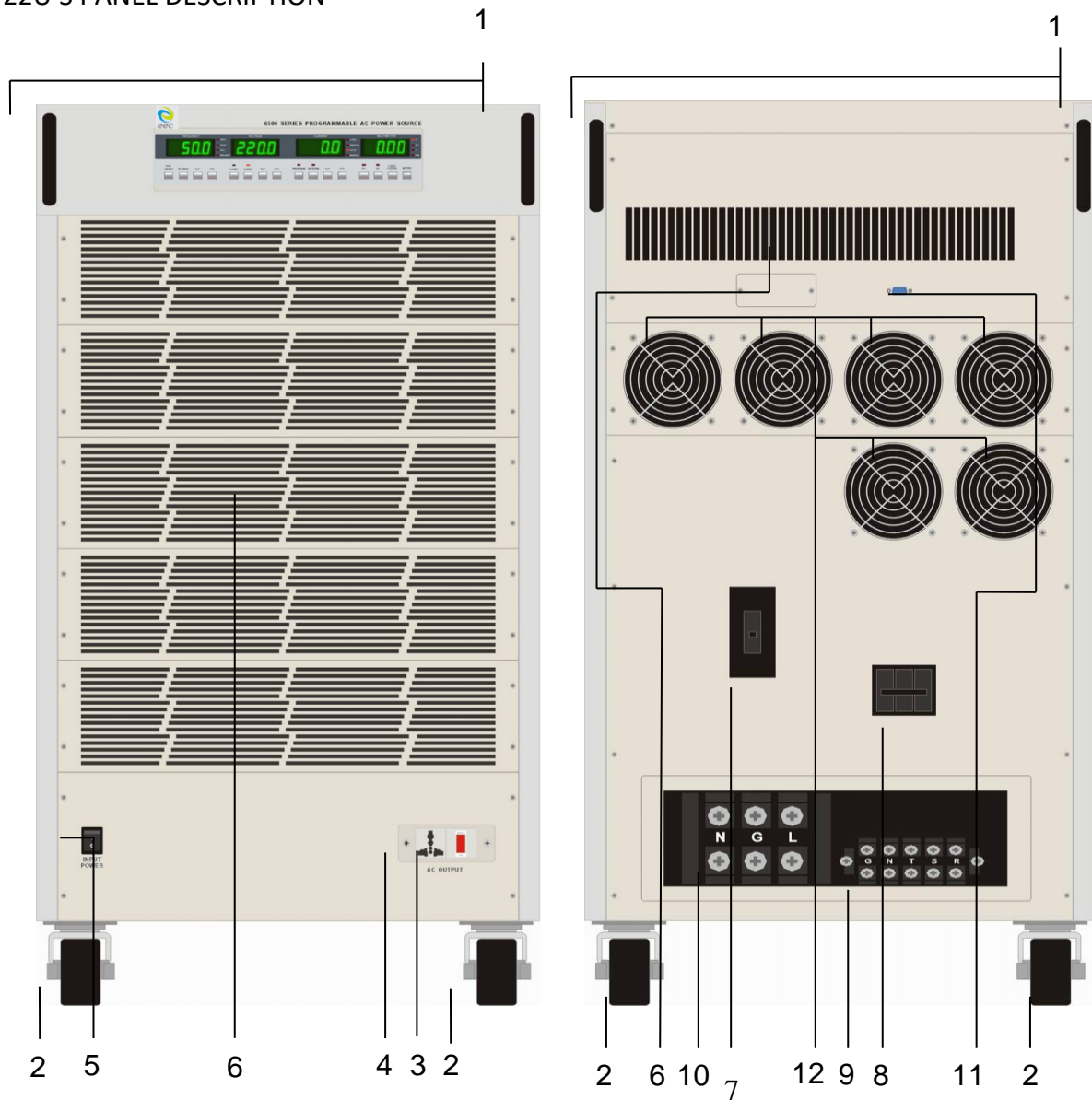
## B. 17U'S PANEL DESCRIPTION



1. Handle
2. Caster Wheels
3. Front Panel Output Switch
4. Universal AC Output Socket (15A)
5. Input Power Switch
6. Ventilation Inlet

7. Output Circuit Breaker
8. Input Circuit Breaker
9. Input Supply Terminal
10. Output Terminal
11. PLC Remote D-Type Connector
12. High-Speed Ventilation Fans

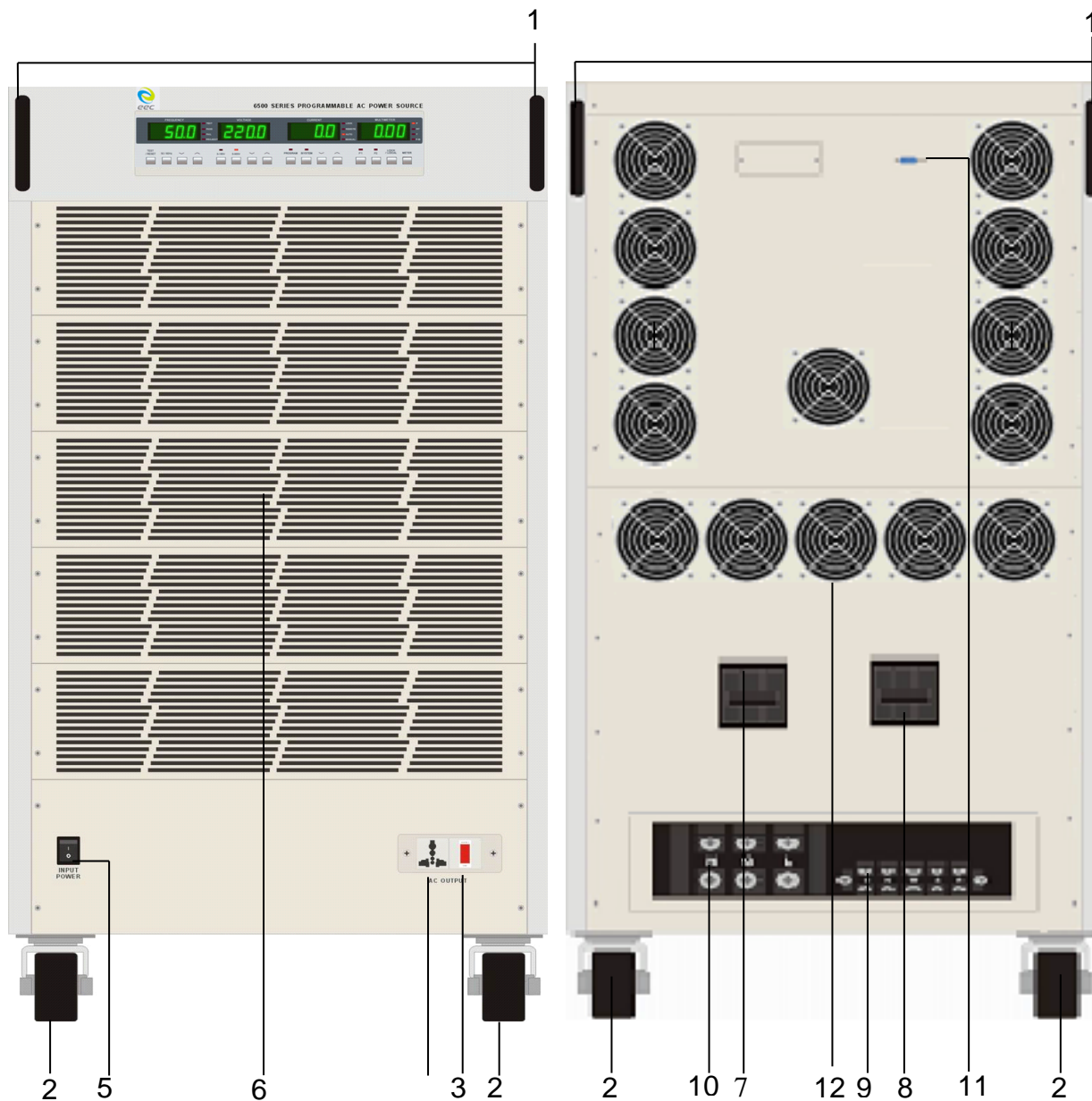
## C. 22U'S PANEL DESCRIPTION



1. Handle
2. Caster Wheels
3. Front Panel Output Switch
4. Universal AC Output Socket (15A)
5. Input Power Switch
6. Ventilation Inlet

7. Output Circuit Breaker
8. Input Circuit Breaker
9. Input Supply Terminal
10. Output Terminal
11. PLC Remote D-Type Connector
12. High-Speed Ventilation Fans

## D. 28U'S PANEL DESCRIPTION



- |  |                                 |
|--|---------------------------------|
| 1. Handle  | 7. Output Circuit Breaker       |
| 2. Caster Wheels                                     | 8. Input Circuit Breaker        |
| 3. Front Panel Output Switch                         | 9. Input Supply Terminal        |
| 4. Universal AC Output Socket<br>(Trip Current: 15A) | 10. Output Terminal             |
| 5. Input Power Switch                                | 11. PLC Remote D-Type Connector |
| 6. Ventilation Inlet                                 | 12. High-Speed Ventilation Fans |

## CHAPTER 4: MANUAL OPERATION

### 4.1 Manual Operation

#### 1. Power On Condition

Every time when turning on the AC Power Source, the voltage and current displays will indicate model and version respectively for the particular AC Power Source. After that the CPU will provide a beep sound to show the pervious setting.



Model

Version

#### 2. Setting of Output Voltage

During the RESET or TEST condition for the AC Power Source, the desire voltage can be set by pressing “ $\wedge$ ” or “ $\vee$ ” key below the Voltage display. High range voltage can be set between 0-300V while low range voltage is 0-150V. Or high range voltage can be set between 0-600V while low range voltage is 0-300V. Press and hold the “ $\wedge$ ” or “ $\vee$ ” key will firstly clear the decimal number of setting to zero. Subsequently, every 0.3 seconds will change a step and thereafter a first integer of setting number will vary and then to the second integer and third integer of the voltage setting respectively. For the third integer, it takes 0.1 seconds only to vary every step in order to speed up the scrolling. The voltage meter will flash and memorize the new setting then exit automatically the setting mode if the setting is hold after 2 minutes.

Press and hold “ $\wedge$ ”, decimal (clear to 0) → 1<sup>st</sup> Integer (0.3sec / step) → 2<sup>nd</sup> Integer (0.3sec / step) → 3<sup>rd</sup> Integer (0.1sec / step)

Press and hold “ $\vee$ ”, decimal (clear to 0) → 1<sup>st</sup> Integer (0.3sec / step) → 2<sup>nd</sup> Integer (0.3sec / step) → 3<sup>rd</sup> Integer (0.1sec / step)

**Note.** If the desired voltage is lower than low range, select high Range first. Otherwise the output voltage only can be set to max value of the low range.

#### 3. Setting of Output Frequency

During the RESET or TEST condition for the AC Power Source, the desire frequency can be set by pressing “ $\wedge$ ” or “ $\vee$ ” key below the Frequency display. Each change on the setting are 0.1Hz/step for normal setting and 1Hz/step for coarse setting. As the 50 Hz or 60 Hz key is being pressed, the desired frequency will be immediately updated. (The same method applied like voltage setting to scroll the display).

Note: Option 45.0-500.0Hz, for frequency setting in the range of 45-99.9 Hz, each change on

the setting are 0.1Hz/step for normal setting and 1Hz/step for coarse setting. In 100-500 Hz range, each change on the setting are 1Hz/step for normal setting and 10Hz/step for coarse setting.

#### **4. Setting of Voltage Range**

If the output voltage is from 0 to 300 V and the desired voltage is lower than 150V, press the 0 – 150 V Range Key first. The LED is lighted to indicate the AC source is in 0-150 Volt range and allow a higher range of current limit. If the output voltage is from 0 to 600 V and the desired voltage is lower than 300V, press the 0 – 300 V Range Key first. The LED is lighted to indicate the AC source is in 0-300 Volt range and allow a higher range of current limit. For the higher voltage range, the range of current limit drops to half as comparing the current limit at lower range (Refer to the specification table). Setting of voltage range may not influence the existing output voltage setting. Anyhow, changing the voltage range during the OUTPUT indicator is ON will lead to the output voltage cutoff (about 20 ms) and this should be avoided if possible. The instrument will also not accept any invalid change of range .(such as changing to low voltage range when the output voltage is set to 200V.)

#### **5. Setting of Current**

During the RESET or TEST condition for the AC Power Source, the desire current limit can be set by pressing “ $\wedge$ ” or “ $\vee$ ” key below the Current display. While the OUTPUT is not activated, pressing the “ $\wedge$ ” or “ $\vee$ ” key will enter to the setting mode of low-limit current. Press further “ $\wedge$ ” or “ $\vee$ ” key to continue scrolling the display in order to change the current limit. If the setting is hold after 2 minutes, it will return to a standby mode from current setting mode. When the meter displays “OFF” at the mode, the current limit is based on output capacity (refer to 2.1 Specification) to limit the output current for protection. Upon exceeding 110% of output capacity, an error message, OCP, will be showed at Frequency display. When the actual current has exceeded the high limit of current setting, the AC Power Source will cut off the output immediately and a HI-A error message is shown.

#### **6. Meter Key**

Pressing the METER key will enable the MULTIMETER display to indicate Power (Watts) or Power Factor measurement, Testing Time (T) and Programmable Memory-Step (P-S), for example, P2-3, represents 2nd group of memory and 3rd step).

#### **7. Executing Output**

Pressing TEST key will turn ON the output voltage or initiate an automatic output operation. First ensure all settings have been done accordingly before pressing the TEST button. When the TEST indicator is lit, the desire output voltage is being supplied to the universal socket on front panel and output terminal on rear panel.

If the indicator is blinking that shows an abnormal operation is encountered, thereby the output voltage will be cut off immediately. By pressing the OUTPUT/RESET key will reset the audible alarm, an error message is indicated.

### **8. Terminating Output**

Upon reaching to complete the testing time, the output operation will terminate automatically, and while the testing time (test - t) is set to "Cont", the output operation will continue until a RESET key from the front panel has been pressed. When the output operation is terminating, the TEST indicator will turn OFF, and meanwhile, as the automatic output operation is tested successfully when the Auto-run-On is turning ON, a beep sound will alert.

### **9. Alarm Reset**

Whenever the AC Power Source experiences abnormal operations such as overload, short circuit, over temperature or exceeding high and low limits of current, power or power factor, the CPU will cut off the output voltage and alert an alarm to user. In this case, the FAIL indicator will blink while the PROTECT indicator will lit (for overload, short circuit and over temperature). The alarm can be reset by pressing RESET key for once. Pressing the key again will then return the error message display to the standby screen. Note: Kindly verify the cause of error before pressing the TEST key to execute the output operation again.

### **10. Front-Panel Lockout**

Press the LOCK/LOCAL key will lead to the LOCK indicator to be lit, in order to disable all keys on the front panel (except METER key). Further pressing the LOCK/LOCAL key again it will reactivate all keys to function normally. Note. The Lockout feature is to prevent any unauthorized alteration.

### **11. Plc Remote**

Able to control the output voltage ON/OFF by using PLC Remote from the 9-pins connector available on the rear panel. It can also perform the output control for 3 programmable memories, which are P1, P2 and P3. **Note. Don't mix with GPIB connect.**

## 4.2 System Parameter Setup

At RESET condition, press “SYSTEM” key to enter SYSTEM parameter setup and SYSTEM indicator will light up. The indication of SYSTEM setup menu will be shown at the Voltage display and the setup parameter for each SYSTEM setup will be shown at Current display. By pressing the “^” or “v” key from the Voltage display, it then allows to scroll the SYSTEM parameter setup menu; Auto run, PLC Remote, GPIb Addr, Auto Adj, P-UP, t Unit, LooP rAtE, FrEq HI, FrEq LO, Volt HI, and Volt LO settings. Pressing the “^” or “v” key from Current display allows varying the parameter value of the system setup. Press SYSTEM key again to return to standby condition after the system parameter setup has completed.



## SYSTEM PARAMETER MENU

SYSTEM PARAMETERS				
FREQUENCY	VOLTAGE	CURRENT	English	Explanation
Auto	run	OFF	Auto run OFF	Auto RUN(sequence output) mode selection. ON=Auto mode. OFF=Manual mode.
		On	ON	
PLC	PLC	OFF	PLC OFF	PLC Remote ON / OFF
		On	ON	
AnLG	buS	OFF	AnLG bus OFF	Analog Bus OFF / V-F
		U-F	V-F	
GP Ib	Addr	0000	GPIb Addr 0	GPIB Address
Auto	Adj	OFF	Auto Adj OFF	Auto Voltage adjust function enable / disable Enable is mean to improve voltage regulation within $\pm 0.1V$
		On	ON	
	P-UP	OFF	P-UP OFF	Output status of power up
		On	ON	
		LAST	LAST	
t	Unit	SEC	t Unit SEC	Testing time unit selection.
		min	Min	
		Hour	Hour	
Loop	rAtE	0001	Loop rAtE 1	Auto Loop cycle ratio selection. $\times 1$ , $\times 10$ , $\times 100$ ,
		10	10	
		100	100	
UoIt	HI	3000	Volt HI300.0	Maximum voltage setting limit
UoIt	LO	1500	Volt LO150.0	Minimum voltage setting limit
FrEq	HI	630	FrEq HI 63.0	Maximum frequency setting limit
FrEq	LO	470	FrEq LO 47.0	Minimum frequency setting limit
OC	FoId	On	OC FoId ON	Over Current Fold BackON/OFF setting
		OFF	OFF	

### 1. Auto Run Mode Selection

The Frequency display will indicate “Auto” and the Voltage display shows “run”. Press the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select OFF (Manual Mode) or ON (Auto Mode). Upon selecting the Auto run mode, the settings for this Auto mode will further be shown.

### 2. PLC Remote

The Voltage display will indicate “PLC” and by pressing the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select ON/OFF for the PLC Remote. As the PLC Remote setting is OFF, the control of operation is via the front panel. Meanwhile, when the setting is ON, then the operation will be



controlled by a remote control box from the rear panel. Once the setting is ON, the Current display will indicate “PLC-ON” and the buzzer will sound beeps twice whenever a key is being pressed. At this time, all keys at front panel are disabled except the LOCK/LOCAL, SYSTEM and METER keys are functioning as normal.

### **3. Analog Bus (Option)**

Only available when this option has included. The Frequency display will indicate “AnLG” while the Voltage display indicates “bus”. By pressing the “ $\wedge$ ” or “ $\vee$ ” key from the Current display, select the OFF/V-F. It can use external 0 – 10Vdc input to control output voltage and frequency in manual mode. Please refer to Chapter 6.2.

### **4. GPIB Address**

Only available when this option has included. The Frequency display will indicate “GPIb” while the Voltage display indicates “Addr”. By pressing the “ $\wedge$ ” or “ $\vee$ ” key from the Current display, select the GPIB address. Please refer to Chapter 5: GPIB Interface for details.

### **5. Auto Voltage Adjust**

At this setup, the Frequency display will indicate “Auto” while the Current display indicates “Adj”. Press the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select ON/OFF for the Auto Voltage Adjust function. When the Auto Voltage is enabled, the voltage regulation can be improved within  $\pm 0.1V$  as comparing to actual output value and setting value.

### **6. Power- Up Status**

While the Voltage display indicates “P-UP”, press the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select ON/OFF/LAST for the output status. As the Power-Up is turned OFF, the output is set to be at OFF condition after turn OFF or ON again the AC source. When the Power-Up is ON, then the output is instantly ON after the AC Power Source is being OFF and ON again. When the Power-Up is set to LAST, the display will indicate last POWER OFF setting status. Note: This setup will only in effective after turning off and on the AC Power Source.

### **7. Testing Time Unit**

When the Frequency display indicates “t”, press the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select SEC/Min/Hour. The testing time dwells during the output operation is based on the testing time unit setting at this setup.

### **8. Auto Loop Cycle Ratio Selection**

The Frequency display will indicate “LooP” while the Voltage display indicates “rAtE”. By pressing the “ $\wedge$ ” or “ $\vee$ ” key from the Current display, choose the “ $\times 1$ ”, “ $\times 10$ ” or “ $\times 100$ ” for the loop cycle ratio selection. This selected loop rate will then be used as a multiplier ( $\times 1$ ,  $\times 10$  or  $\times 100$ ) to the

value of "Loop CyCL" setting under the PROGRAM parameter.

### **9. Frequency Hi Limit Setting**

The Frequency display will indicate "FrEq" and the Voltage display shows "HI". Press the "∧" or "∨" key from the Current display to adjust the high limit frequency within the range of 47.0-63.0Hz. This feature disallows user to vary the output frequency during RESET and TEST conditions, which may cause to exceed the acceptable range of frequencies for any particular DUTs. (Note: Else two ranges: 45.0-500.0Hz and 400Hz for option.)

### **10. Frequency Low Limit Setting**

The Frequency display will indicate "FrEq" and the Voltage display shows "LO". Press the "∧" or "∨" key from the Current display to adjust the low limit frequency within the range of 47.0-63.0 Hz. This feature disallows user to vary the output frequency during RESET and TEST conditions, which may cause to exceed the acceptable range of frequencies for any particular DUTs. (Note: Else two ranges: 45.0-500.0Hz and 400Hz for option.)

### **11. Voltage Hi Limit Setting**

The Frequency display will indicate "Volt" and the Voltage display shows "HI". Press the "∧" or "∨" key from the Current display to adjust the high limit voltage. This feature disallows user to vary the output voltage during RESET and TEST conditions, which may cause to exceed the acceptable range of voltages for any particular DUTs.

### **12. Voltage Low Limit Setting**

The Frequency display will indicate "Volt" and the Voltage display shows "LO". Press the "∧" or "∨" key from the Current display to adjust the low limit voltage. This feature disallows user to vary the output voltage during RESET and TEST conditions, which may cause to exceed the acceptable range of voltages for any particular DUTs.

### **13. Over Current Fold Back**

The Frequency display will indicate "OC" and the Voltage display shows "Fold". press the "∧" or "∨" key from the Current display to select ON/OFF for the output status. (The same method applied as voltage setting). Setting On, When output current is higher than Programmable Parameters "A-HI" current setting current value, it will keep constant A-HI setting current value output.

### 4.3 Program Parameter Setting

At RESET condition, press “PROGRAM” key to enter PROGRAM parameter setup whereby the “PROGRAM LED” indicator is lit. In the meanwhile, the indication of PROGRAM setup menu will be shown at the Voltage display and the setup parameter for each PROGRAM setup will be shown at Current display. By pressing the “ $\wedge$ ” or “ $\vee$ ” key from the Voltage display, it then allows to scroll the PROGRAM parameter setup menu; Prog, Loop CyCL, StEP, Volt, FrEq, tEst t, dLAY t, A-HI, A-LO, P-HI, P-LO, PF-H, PF-L, Conn StEP. Pressing the “ $\wedge$ ” or “ $\vee$ ” key from Current display allows varying the parameter value of the PROGRAM setup. Press PROGRAM key again to return to standby condition after the PROGRAM parameter setup has completed.

## PROGRAM PARAMETERS

PROGRAM PARAMETERS				
FEQUENCY	VOLTAGE	CURRENT	English	Explanation
8888	P269	8888	Prog 1	Program selection
LoOP	CyCL	Cont	Cont	Auto loop cycle setting. Continue, OFF or 2-999 times.
		8OFF	LooP CyCL OFF	
		9999	9999	
8888	StEP	8888	StEP 1	Step selection
8888	Uo1t	100.0	Volt 100.0	Output voltage setting
8888	FrEq	60.0	FrEq 60.0	Output frequency setting
tEst	t Cont	Cont	tEst t Cont	Testing time setting
		9999	9999	
dLAY	t0	8880	dLAY t 0	Delay judgement time setting
8888	A-HI	8OFF	A-HI OFF	AMP(current) high limit
		9999	99.99	
8888	A-LO	8OFF	A-LO OFF	AMP(current) low limit
		9999	99.99	
8888	P-HI	8OFF	P-HI OFF	Power high limit
		9999	99.99	
8888	P-LO	8OFF	P-LO OFF	Power low limit
		9999	99.99	
rAnP	UP88	8OFF	rAnP UP OFF	Ramp up time setting
		9999	999.9	
rAnP	dOun	8OFF	rAnP dOun OFF	Ramp down time setting
		9999	999.9	
Conn	StEP	8OFF	Conn StEP OFF	Connect step enable/disable
		8On8	On	

### 1. Program Memory Selection

When the voltage display indicates “Prog” under PRORAM parameter setup, press “ $\wedge$ ” or “ $\vee$ ” key to select “1 ~ 8” of memories. If the program memories (P1~P8) have to be interconnected, it can be achieved by turning ON the “Auto run”. Each step of a memory can be linked to the next step up to 400 steps (8 Programs  $\times$  5 Steps) in sequence by turning ON the “Conn StEP”. All different settings on voltage, frequency, testing time, current, power, and power factor high/low limits can be stored at each step individually.

## 2. Auto Loop Cycle Setting

The Frequency display will indicate "Loop" and the Voltage display shows "CyCL". Press the " $\wedge$ " or " $\vee$ " key from the Current display to select "Cont", "OFF" and "2"~"999". Setting of "Cont" means continuous, and "OFF" is single operation. For "2"~"9" setting, it becomes the number of sequence to be repeated for running operation. This selected loop cycle will then be multiplied by the "Loop CyCL" of the SYSTEM parameter, which acts as a multiplier ( $\times 1$ ,  $\times 10$  or  $\times 100$ ) to the selected value of "Loop CyCL". (For example, Loop Cycle is set to "2" and the Loop Rate has selected " $\times 10$ ". Therefore, the Auto run operation will execute for 20 times.)

## 3. Program Memory Step Selection

As the Voltage display indicates "StEP", press the " $\wedge$ " or " $\vee$ " key from the Current display to select "1"~"5". Each Program memory is consisting of 5 Steps that different settings on voltage, frequency, testing time, current, power, and power factor high/low limits can be stored at each step individually.

## 4. Output Voltage Setting

As the Voltage display indicates "Volt", press the " $\wedge$ " or " $\vee$ " key from the Current display to adjust voltage within the range of "0.0"~"Maximum Voltage". For the voltage set above low voltage range, the high voltage range must be selected. Any alteration to be made for the voltage setting on the Voltage display during the RESET condition will also change the other voltage setting value for auto run operation as well.

## 5. Output Frequency Setting

As the Voltage display indicates "FrEq", press the " $\wedge$ " or " $\vee$ " key from the Current display to adjust the frequency within the range of "47.0"~"63.0".. Any alteration to be made for the frequency setting on the Frequency display during the RESET condition will also change the other frequency setting value for auto run operation as well. Note: Else two ranges: 45.0-500.0Hz and 400Hz for option.

## 6. Testing Time Setting

As the Frequency display indicates "tEst" and the Voltage display indicates "t", press the " $\wedge$ " or " $\vee$ " key from the Current display to select "Cont" or "1" ~ "9999". Setting of "Cont" means continuous, which repeats after the time has reached "9999". The testing time will be executed that is based on the testing time unit (SEC, Min, or Hour) being set under the SYSTEM parameter. Press "RESET" key on the front panel in order to terminate the testing operation. The testing time setting is defined as the setting of time that is required for the Loop Cycle to execute a single operation.

## 7. Delay Judgment Time Setting

As the Frequency display indicates "dLAY" and the Voltage display indicates "t", press the "∧" or "∨" key from the Current display to adjust the delay time between "0" ~ "9999". The delay judgment time is set to assign time period that will not make any judgment to all limits (Ex: A,P,PF High / Low Limit Setting).

Note: The delay judgment time may not longer than the testing time. If the testing time has been selected to "Cont", the delay judgment time will be fixed to "0", and therefore, the run operation is always carried out with the limit judgments.

## 8. Current High Limit Setting

As the Voltage display indicates "A-HI", press the "∧" or "∨" key from the Current display to select "OFF" or "0.0"~"Maximum capacity current (Ex: 10KVA, 84A/42A)". Setting of "OFF" means no judgment to be made. Note: Whenever there is a pressing on the "∧" or "∨" key from the Current display during the RESET condition, it will also change the current high limit setting value.

## 9. Current Low Limit Setting

As the Voltage display indicates "A-LO", press the "∧" or "∨" key from the Current display to select "OFF" or "0.1"~"Maximum capacity current (Ex: 10KVA, 84A/42A)". Setting of "OFF" means no judgment to be made.

## 10. Power High Limit Setting

As the Voltage display indicates "P-HI", press the "∧" or "∨" key from the Current display to select "OFF" or "0.01"~"Maximum capacity power (Ex: 10KVA, 10.00KW)". Setting of "OFF" means no judgment to be made.

## 11. Power Low Limit Setting

As the Voltage display indicates "P-LO", press the "∧" or "∨" key from the Current display to select "OFF" or "0.01"~"Maximum capacity power (Ex: 10KVA, 10.00KW)". Setting of "OFF" means no judgment to be made.

## 12. Ramp Up Setting

As the Frequency display indicates "rAnP" and the Voltage display indicates "UP", press the "∧" or "∨" key from the Current display to select "OFF" or "0.1"~"999.9".

## 13. Ramp Down Setting

As the Frequency display indicates "rAnP" and the Voltage display indicates "dOun", press the "∧" or "∨" key from the Current display to select "OFF" or "0.1"~"999.9".

#### 14. Connect Step

As the Frequency display indicates “Conn” and the Voltage display indicates “SteP”, press the “ $\wedge$ ” or “ $\vee$ ” key from the Current display to select “On” or “OFF”. Setting of “On” means there is a continuous operation after a step is completed to the next step (Ex: P1-1 → P1-2), while Setting of “OFF” represents there is no connection between steps.

Note: If the run operation is executed in the connection of several steps, it must first set the “Prog” to “On” before connecting the steps for any run operation (Ex: P1-5 → P2-1).

### 4.4 DISPLAYED MESSAGES

Below are the descriptions of error messages that may occur at abnormal conditions:

At any abnormal conditions, there are several error messages to be indicated on the display LEDs. Thereafter the output will be disabled and the alarm will sound. The “FAIL” and “PROTECT” indicators will also light up at the same time. If the indicator is blinking that shows an abnormal operation is encountered, thereby the output voltage will be cut off immediately. Press the RESET key to reset the audible alarm. The error message is eliminated and returns to the RESET condition when the RESET key is pressed again.

#### **WARNING**

All error messages are occurred at any abnormal conditions and therefore must be recorded. Check the cause of error to ensure the problem is eliminated before restarting the operation, or contact EEC or our official distributors for further assistance.

If the input voltage is below the CPU setting level when turning on the AC Power Source, the Voltage display will indicate “FAIL” and the alarm will sound. There is no effect to reset this error message by pressing any keys. It needs to turn off the input power in order to reset the alarm.



If the output voltage has exceeded 5V of setting voltage at 0-150V range or has exceeded 10V of setting voltage at 0-300V range, the Frequency display will indicate “OUP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the output current has exceeded 110% of maximum current rating, the Frequency display will indicate “OCP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded

voltage and current respectively.



If the output voltage is under 5V of setting voltage at 0-150V range or under 10V of setting voltage at 0-300V range for 3 second, the Frequency display will indicate “LVP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



Model ( **6510** 、 **6520** 、 **6530** 、 **6560** 、 **6580** )

If the output power has exceeded 105-110% of rating power for 5 second or the output power has exceeded 110% under 1 second, the Frequency display will indicate “OPP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.

Model ( **6540** )

If the output power has exceeded 100% of rating power for 10s, the Frequency display will indicate “OPP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the output power has exceeded 100% of rating power for 10s, the Frequency display will indicate “OPP” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the output current has exceeded the high limit current, the Frequency display will indicate “HI-A” and the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the output current is below the low limit current, the Frequency display will indicate “LO-A” and



the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the output power has exceeded the high limit power, the Frequency display will indicate “HI-P” and the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the output power is below the low limit power, the Frequency display will indicate “LO-P” and the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the output power factor has exceeded the high limit power factor, the Frequency display will indicate “HI-PF” and the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the output power factor is below the low limit power factor, the Frequency display will indicate “LO-PF” and the alarm will sound. Consequently, the “FAIL” indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



If the input voltage has reached below the 20% of the operating voltage, the Frequency display will indicate “Lodc” and the alarm will sound, since the input voltage has gone below the requirement range of operating voltage for this AC Power Source. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the input voltage exceeds the 20% of the operating voltage, the Frequency display will indicate “HIdc” and the alarm will sound, since the input voltage has reached above the requirement range of operating voltage for this AC Power Source. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the input voltage cuts off for a short period and return as normal, the Frequency display will indicate “AcLP”. This shows that an abnormal input voltage has occurred and thus the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the fuse is blown, the Frequency display will indicate “FUSE”. This shows that the input voltage has exceeded the fuse protection rating and causes the fuse to blow and thus the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the IGBT is overloaded, the Frequency display will indicate “IGbt” and the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



If the heat sink of the instrument itself has exceeded 110°C, the Frequency display will indicate “OtP”. This shows that the heat sink is overheated and thus the alarm will sound. Consequently, the “FAIL” indicator will blink while the “PROTECT” indicator will light up. The Voltage and Current displays will show the overloaded voltage and current respectively.



## CHAPTER 5: DESCRIPTION of OPERATION

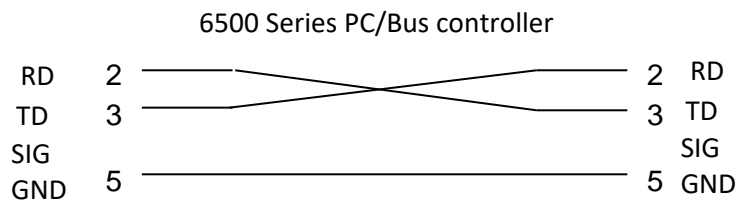
### Bus Remote Interface RS-232 / GPIB

This chapter provides information on the proper use and configuration of bus remote interface for RS232 and GPIB interface, whereby both interfaces are using exactly same command lists. These interfaces are optional on 6500 Series AC Power Source.

### 5.1 RS-232 Interface

#### Introduction

The RS232 connection is configured as follows for a 9 pins Serial Port interface:



The COM port should have the following configuration: 9600 baud, 8 data bits, 1 stop bit, no polarity, and etc. This interface does not support XON/XOFF protocol or any hardware handshaking. The controller should be configured to ignore the Handshaking Lines DTR (PIN 4), DSR (PIN 6) and RTS (PIN 9). If the port cannot be configured through software to ignore the lines, the handshake lines should be then jumped together in two different sets. The PIN 4 and 6 jumped together while PIN 7 and 8 jumped together at the controller end of the cable.

When sending command over the RS232 bus the AC Power Source will send a response string of 06 Hex or 6 decimal and the Acknowledge (ACK) ASCII control code if the transfer was recognized and completed by the AC Power Source. If there is an error with the command string that is sent, the AC Power Source will respond with 15 Hex or 21 decimal and the Not Acknowledge (NAK) ASCII code. The ACK or NAK response allows for software handshaking, in order to monitor and control data flow. When requesting data from the AC Power Source, it will automatically send the data back to the controller input buffer. The controller input buffer will accumulate data being sent from the AC Power Source including the ACK and NAK response strings, until the controller has read it. When the strings or command has been sent, it must be terminated with **LF=(0AH)**, such as **"TEST"+LF**.

## 5.2 GPIB Interface

This interface of a device connected to the BUS is specified by its interface functions. These functions provide the means for a device to receive, process, and send messages over the bus. The interface functions are listed in the chart below:

IEEE-488 INTERFACE	Complete Handshake Capability
	Talker/Listener Capability
	Service Request Capability
	No Remote/Local Capability
	No parallel poll Capability
	No Device Clear Capability
	No Device Trigger Capability
	No Controller Capability
	3 state driver
	Setting of test condition and parameters
	Reading of display status
	Reading of measurement results
Controllable Item	Test/Reset Control
DATA FORMAT	ASCII
TERMINATOR	CR + LF (+ EOI)

**Note: 6500 GPIB card supports EOI functions.**

### GPIB Address

All the above commands are required by the IEEE-488.2 GPIB Interface BUS. The factory default address of the 6500 Series AC Power Source is set to 8.

## 5.3 RS-232/GPIB Interface Command List

The following is the commands list for ON/OFF output operation and all other parameter settings. When programming these commands, it does not require any parameter values to be included with the command. Before using the commands of specific functions into a program, it must first create a file name (COMMAND: FN nn,xxxx) and the selected step to load into RAM (COMMAND:SS nn), in order to enter into each specific parameter that can be edited.

When the strings or command has been sent, it must be terminated with EOI.

**Basic Commands:**

Command	Value	Description
TD?	By PHASE	FREQ,VOLT,CURR,WATT,PF,TIMER
TEST	Power On	
RESET	Power Off	
METER X	0	Power Reading
	1	Power Factor Reading
	2	Timer Reading
	3	Program -Step
METER?		Displayed parameter of meter Query
RANG X	0	Low 0 - 150V (or 0=Low 0-300V)
	1	High 0 - 300V (or 1=High 0-600V)
RANG?		Setting Range Query

\* The format of acknowledgement is "Frequency, Voltage, Current, Watt, PF, Time"

**Program Commands:**

COMMAND	Value	Description
PROG X	0 - 8	Program Number
PROG?		Program Number Query
AR X	0	Auto Run Off
	1	Auto Run On
AR?		Auto Run setting Query
LC XXXX	0	Loop Cycle "Continuous"
	1	Loop Cycle "Once"
	2 - 9999	Loop Cycle 2 - 9999
LC?		Loop Cycle Query
STEP X	1 - 5	Step Number
STEP?		Step Number Query
VOLT XXX.X	0.0 - 300.0	Voltage
VOLT?		Voltage Query
FREQ XXX.X	47.0 - 630.0	Frequency (Option 45.0-500.0 or 400Hz)
FREQ?		Frequency Query
DELAY XXXX	0 - 9999	Delay Time
DELAY?		Delay Time Query
DWELL XXXX	0 - 9999	Dwell Time
DWELL?		Dwell Time Query
CHI XXX.X	0.0 - max. A	High limit Current

CHI?		High limit Current Query
CLO XXX.X	0.0 - max. A	Low Limit Current
CLO?		Low Limit Current Query
PHI XXX.X	0.0 - max. P	High Limit Power
PHI?		High Limit Power Query
PLO XXX.X	0.0 - max. P	Low Limit Power
PLO?		Low Limit Power Query
TUP XXX.X	0.1 – 999.9	Ramp up Time
TUP?		Ramp up Time Query
TDN XXX.X	0.1 – 999.9	Ramp down Time
TDN?		Ramp down Time Query
CONNECT X	0	Memory Connection OFF
	1	Memory Connection ON
CONNECT?		Memory Connection Query

#### System Commands:

COMMAND	Value	Description
PLC X	0	PLC Off
	1	PLC On
PLC?		PLC Status Query
BUS X	0	Analog Bus Off **
	3	V-F Type Analog Bus
BUS?		Type of Analog Bus Query
ADJ X	0	Auto Adjust Off
	1	Auto Adjust On
ADJ?		Auto Adjust Status Query
ADDRESS X	0 - 31	GPIB Address
ADDRESS?		GPIB Address Query
PUP X	0	Power Up Status Off(Stand By)
	1	Power Up Status On(Outputting)
	2	Power Up Status Last Setting
PUP?		Power Up Status Query
TUNIT X	0	Time Unit Second
	1	Time Unit Minute
	2	Time Unit Hour
TUNIT?		Time Unit Query

LRATE X	1	Loop Rate 1
	10	Loop Rate 10
	100	Loop Rate 100
LRATE?		
VHI XXX.X		
VHI?		
VLO XXX.X		
VLO?		
FHI XXX.X		
FHI?		
FLO XXX.X		
FLO?		
OF X	0	OC Fold Off
	1	OC Fold On
OF ?		

#### IEEE 488.2 Common Commands

Command	Description	Acknowledgement
*IDN?	Identification Query	Company, Model Number, Serial Number, Firmware Revision
*RST	Reset Command	
*TST?	Self-Test Query	00H=OK
		01H=Test EEPROM Error
*CLS	Clear Standard Event Status Register and Service Request Register	
*OPC	Operation Complete	
*OPC?	Operation Complete Query	1= TEST completed, 0= TEST in progress
*WAI	Wait for next command	01H(1) TEST completed
*ESR?	Standard Event Status Register Query	01H(1) TEST completed
		10H(16) Operation error
		20H(32) Command error
		80H(128) Start-up Condition
*ESE XXX	Standard Event Status Enable Command	
*ESE?	Standard Event Status Enable Query	0 - 255
*STB?	Read Status Byte Query	01H(1) ALL PASS

		02H(2) FAIL
		04H(4) ABORT
		08H(8) Processing
		20H(32) ESB BIT
		40H(64) MSS
		80H(128) Prompt
*SRE XXX	Service Request Enable	
*SRE?	Service Request Enable Query	0 - 255
*PSC X	Power-On Status	
*PSC?	Power-On Status Query	

## 5.4 Non Volatile Memory

The instrument saves each parameter in non-volatile memory when the file save "FS" command is used to save the file. The non-volatile memory has a limited write cycle life, therefore for programmers who wish to send all parameters before executing each test the "FS" command should not be used. The parameters will be stored in the CPU's Random Access Memory (RAM) until another memory location is selected. However, settings written to RAM from GPIB/RS-232 mode will be lost when power is shut down. Parameter changes to RAM are unlimited and will not effect the life of the internal non-volatile memory chip.



## CHAPTER 6: DESCRIPTION of APPLICATION

### 6.1 Remote Interface

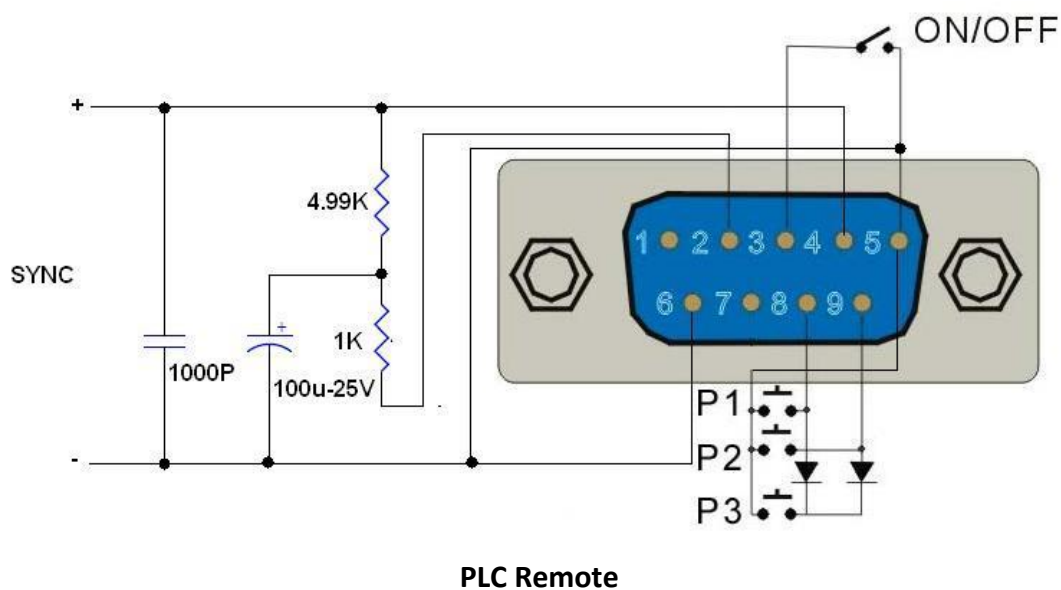
There is a remote interface connector attached on the rear panel of 6500 Series AC Power Source and thus can control any test operation via remote once the PLC Remote setting from SYSTEM setup parameter is turned on. The 9-pin D-type connector consists of I/O signals for ON/OFF, 3 memories (P1, P2, P3) input control and “SYNC” output signal.

#### Input Signal and Storage:

Upon turning on the PLC Remote setting, the display will indicate “PLC-ON” and the buzzer will beep twice before return to RESET condition, when any key on the front panel is pressed. In fact, whenever there is an abnormal output detected, it can be reset by pressing the RESET key from the front panel or the ON/OFF button from the PLC Remote and return to RESET condition.

Below is the Pin Configuration of Remote:

1. ON/OFF                      Connect between PIN 3 and PIN 5
2. Memories Input Control can be achieved by using Normally Open (N.O) Momentary Button and the connection as:
  - a     Memory 1 (P1)        Connect between PIN 5 and PIN 8
  - b     Memory 2 (P2)    Connect between PIN 5 and PIN 9
  - c     Memory 3 (P3)        Connect PIN 8 and PIN 9 with a series diode (ex. D4148) at each pin and the joint point is connected to PIN 5.
3. SYNC                      Connect PIN 4 and PIN 6 with a series capacitor and resistance.



## 6.2 Analog Card (Option)

This function provides two BNC connections, one for the control voltage and the other for the control frequency. User can input 0 - 10Vdc from outside to control the output voltage and frequency. If user want to control the voltage, then user must to connect the external input signal to EXT. V. When voltage range at high range, user input 5Vdc that AC source will output 150Vac. The frequency is the same way.

Examples for formulas

- Output voltage 0 - 300V:

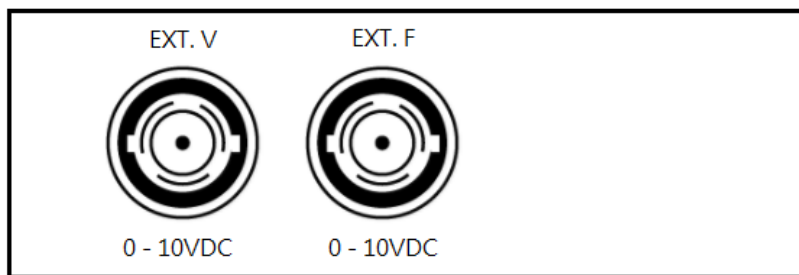
$$V_{out(ac)} = V_{ext(dc)} / 10V_{dc} \times 300V_{ac} \text{ (300V High Range)}$$

$$V_{out(ac)} = V_{ext(dc)} / 10V_{dc} \times 150V_{ac} \text{ (150V Low Range)}$$

- Output frequency 45 - 70Hz

$$\text{Output frequency(Hz)} = V_{ext(dc)} \times (70\text{Hz} - 45\text{Hz}) / 10V_{dc} + 45\text{Hz}$$

$$\text{Output frequency(Hz)} = V_{ext(dc)} \times (\text{Max. F} - \text{Min. F}) / 10V_{dc} + \text{Min. F}$$



Caution: Input voltage can't exceed 10Vdc.

## CHAPTER 7: CALIBRATION PROCEDURE

The calibration procedure is with model 6510 and output voltage 0-300V for its example.

### 7.1 Calibration Procedure

1. All the AC Power Sources are calibrated at the factory before delivery. Unless necessarily, kindly do not re-calibrate within the first 12 months.
2. Ensure the model version is correct before turn OFF the AC Power Source. Press and hold "LOCK/LOCAL" key while turn ON the AC Power Source. After two seconds, the AC Power Source will indicate model number and version. It is now at calibration mode and press "∧" or "∨" key under the Frequency display to select a calibration menu.

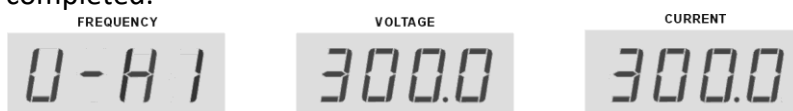


3. Low Range Voltage (V-LO) Calibration: Press "∧" or "∨" key from the Frequency display to select "V-LO". Connect a calibrated true RMS Voltmeter on one of the output socket and press TEST key in order to activate the CPU to read a low range offset voltage and send a 150VAC output voltage. The accurate RMS Voltmeter will indicate an actual voltage value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Using the voltage value from the RMS Voltmeter, press "∧" or "∨" key from the Current display to scroll the display which indicate the current voltage value, in order to set the voltage according to the RMS Voltmeter. After it is done, press "LOCK/LOCAL" key to save the data stored and the low range voltage calibration is completed.

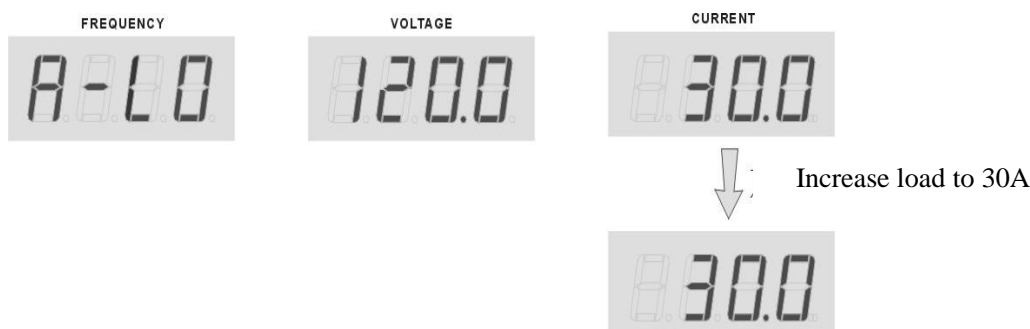


4. High Range Voltage (V-HI) Calibration: Press "∧" or "∨" key from the Frequency display to select "V-HI". Connect a calibrated true RMS Voltmeter on one of the output socket and press TEST key in order to activate the CPU to read a high range offset voltage and send a 300VAC output voltage. The accurate RMS Voltmeter will indicate an actual voltage value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Using the voltage value from the RMS Voltmeter, press "∧" or "∨" key from the Current display to scroll the display, which indicates the current voltage value, in

order to set the voltage according to the RMS Voltmeter. After it is finished, press “LOCK/LOCAL” key to save the data stored and the high range voltage calibration is completed.



5. Low Range Current (A-LO) Calibration: Press “ $\wedge$ ” or “ $\vee$ ” key from the Frequency display to select “A-LO”. Connect a variable resistor as load and a calibrated true RMS Ammeter on one of the output socket and press TEST key in order to activate the CPU to read a low range offset current and send a 120VAC output voltage. The accurate RMS Ammeter will indicate an actual current value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Adjust the load or voltage to get the reading from the ammeter to be 30A. Using the current value from the RMS Ammeter, press “ $\wedge$ ” or “ $\vee$ ” key from the Current display to scroll the display, which indicates the current value, in order to set the current according to the RMS Ammeter. After it is done, press “LOCK/LOCAL” key to save the data stored and the low range current calibration is completed.



6. High Range Current (A-HI) Calibration: Press “ $\wedge$ ” or “ $\vee$ ” key from the Frequency display to select “A-HI”. Connect a variable resistor as load and a calibrated true RMS Ammeter on one of the output socket and press TEST key in order to activate the CPU to read a high range offset current and send a 120VAC output voltage. The accurate RMS Ammeter will indicate an actual current value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Adjust the load or voltage to get the reading from the ammeter for the output current value. Using the current value from the RMS Ammeter, press “ $\wedge$ ” or “ $\vee$ ” key from the Current display to scroll the display, which indicates the current value, in order to set the current according to the RMS Ammeter. After it is done, press “LOCK/LOCAL” key to save the data stored and the high range current calibration is completed.



Increase load to 80A (10KVA=80A)



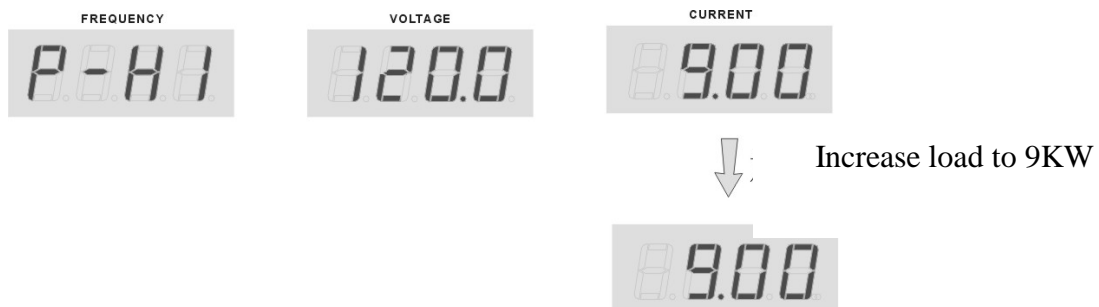
7. Low Range Power (P-LO) Calibration: Press “ $\wedge$ ” or “ $\vee$ ” key from the Frequency display to select “P-LO”. Connect a variable resistor as load and a calibrated true RMS Power Meter on one of the output socket and press TEST key in order to activate the CPU to read a low range offset power and send a 120VAC output voltage. The accurate RMS Power meter will indicate an actual power value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Adjust the load or voltage to get the reading from the RMS Power Meter to be 3KW. By using the power value from the RMS Power Meter, press “ $\wedge$ ” or “ $\vee$ ” key from the Current display to scroll the display, which indicates the power value, in order to set the power according to the RMS Power Meter. After it is done, press “LOCK/LOCAL” to save the data stored and the low range power calibration is completed.



Increase load to 3KW



8. High Range Power (P-HI) Calibration: Press “ $\wedge$ ” or “ $\vee$ ” key from the Frequency display to select “P-HI”. Connect a variable resistor as load and a calibrated true RMS Power Meter on one of the output socket and press TEST key in order to activate the CPU to read a high range offset power and send a 120VAC output voltage. The accurate RMS Power Meter will indicate an actual power value while the Current display on the AC Power Source will indicate a necessary value needed to be calibrated. Adjust the load or voltage to get the reading from the power meter for the output power value. Using the power value from the RMS Power Meter, press “ $\wedge$ ” or “ $\vee$ ” key from the Current display to scroll the display, which indicates the power value, in order to set the power according to the RMS Power Meter. After it is done, press “LOCK/LOCAL” to save the data stored and the high range power calibration is completed.



9. If the calibration has to be terminated half way, user can just press RESET key to exit the calibration mode.
10. After the calibration is completed, turn OFF the AC Power Source.

## CHAPTER 8: APPENDIX

### 8.1 Service and Maintenance

#### Users' Protection

To avoid electric shock, do not dismantle the cover of the AC Power Source. When any abnormal symptom happens on the instrument, please kindly contact EEC office or the authorized local distributor for further assistance. Attached block diagram and wiring diagrams of 6500 Series AC Power Source are for reference purpose.

#### Consistency of Service

6500 Series AC Power Source with the input circuit and all related parts are required to be checked and calibrated at least once every year. This is to protect user in terms of safety and to ensure a high accuracy of this AC Power Source all times.

#### Users' Modification

Modification by user on the AC power Source internal circuits and parts are not allowed. The warranty is void if the warranty seal is broken or the AC Power Source has been opened by unauthorized person. EEC reserves the right to convert as original circuit and charge the customer.

### 8.2 Conductor Sizes and Maximum Current List

6500 Series Input and Output Conductor (Wire) Size Specifications (Below environment temperature 35°C)

N.F.B	Conductor Size
10 A	1.25 mm <sup>2</sup>
15 A	2.0 mm <sup>2</sup>
20 A	3.5 mm <sup>2</sup>
30 A	5.5 mm <sup>2</sup>
40 A	5.5 mm <sup>2</sup>
50 A	14 mm <sup>2</sup>
60 A	22 mm <sup>2</sup>
75 A	22 mm <sup>2</sup>
100 A	38 mm <sup>2</sup>
125 A	50 mm <sup>2</sup>
150 A	50 mm <sup>2</sup>
175 A	80 mm <sup>2</sup>

200 A	80 mm <sup>2</sup>
225 A	125 mm <sup>2</sup>
250 A	125 mm <sup>2</sup>
275 A	150 mm <sup>2</sup>
300 A	200 mm <sup>2</sup>
350 A	250 mm <sup>2</sup>
400 A	300 mm <sup>2</sup>
500 A	400 mm <sup>2</sup>

1. Conductors are suggested to have multi-core wires.
2. The cores must be twisted when using the conductors. If the length of conductor has reached above 3 meters, it needs to add higher cross-sectional area from 3.5 mm<sup>2</sup> to 5.5 mm<sup>2</sup>.
3. N.F.B : Non-fuse Breaker.

### 8.3 Input and output terminal size

Input Voltage	Output Voltage	6510		6510P		6520		6520P	
		Input Terminal	Output Terminal	Input Terminal	Output Terminal	Input Terminal	Output Terminal	Input Terminal	Output Terminal
33208	300V	M6	M8						
	600V								
33200	300V			M6	M8	M8	M10	M8	M10
	600V			M6	M6				
33220	300V	M6	M8	M6	M8	M8	M10	M6	M10
	600V	M6	M6	M6	M6	M8	M8		
33380	300V	M4	M8	M4	M8	M6	M10		
	600V								
33400	300V								
33415	300V							M6	M10
	600V	M4	M6						
33440	600V								
34208	300V								
34380	300V	M4	M8	M4	M8	M6	M10	M6	M10
	600V	M4	M6	M4	M6	M6	M8		
34400	300V					M6	M10		
34415	300V	M4	M8			M6	M10	M6	M10
	600V	M4	M6			M6	M8		



Input Voltage	Output Voltage	6530		6530P		6540		6540P	
		Input Terminal	Output Terminal	Input Terminal	Output Terminal	Input Terminal	Output Terminal	Input Terminal	Output Terminal
33208	300V								
	600V								
33200	300V			M8	M10			M10	M10
	600V								
33220	300V	M8	M10			M10	M10		
	600V	M8	M8						
33380	300V								
	600V								
33400	300V								
33415	300V								
	600V								
33440	600V								
34208	300V								
34380	300V	M8	M10	M8	M10	M8	M10		
	600V	M8	M8	M8	M8				
34400	300V								
34415	300V	M8	M10			M8	M10		
	600V	M8	M8	M6	M8				

Input Voltage	Output Voltage	6560		6560P	
		Input Terminal	Output Terminal	Input Terminal	Output Terminal
33208	300V				
	600V				
33200	300V				
	600V				
33220	300V			M10	M16
	600V				
33380	300V				
	600V				
33400	300V				
33415	300V				

	600V				
<b>33440</b>	600V				
<b>34208</b>	300V				
<b>34380</b>	300V	M10	M16	M8	M16
	600V	M10	M16		
<b>34400</b>	300V				
<b>34415</b>	300V	M8	M16		
	600V				